Ministry of Communications and Information Technology

egypt fwd initiative

مستقبلنا رقمي

Implementing EDF Scheduler Using Freertos

Name: Omar Ahmed Dawood
Email: omarahmeddawood11@gmail.com

1. Execution Analysis

Tasks	Periodicity	Deadline	Occurrence during hyper - period	Execution time
Button 1	50ms	50ms	2	40us
Button 2	50ms	50ms	2	40us
Periodic Transmitter	100ms	100ms	1	100us
UART	20ms	20ms	5	180us
Load 1	10ms	10ms	10	5ms
Load 2	100ms	100ms	1	12.5ms

2. System Hyper Period

The time period after which a pattern starts to repeat itself, Hyper - period of any system is the least common multiplier for all the periodicities of all tasks Hence, hyper period here is 100ms

3. CPU Load

Utilization = total execution time/hyper-period

Utilization = 2(40u) + 2(40u) + 1(100u) + 5(180u) + 10(5m) + 1(12.5m)/(100m)

Utilization = 63.16%

4. System Schedulability

- Rate Monotonic

  Utilization = 63.16%
  Number of tasks = 6
  $U < n\,(2\ \hat{}\ (1/n) - 1)$
  If yes then system is schedulable
  0.63 < 0.73
  System is Schedulable

- Time Demand

$$w_i(t) = e_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{p_k} \right\rceil e_k$$

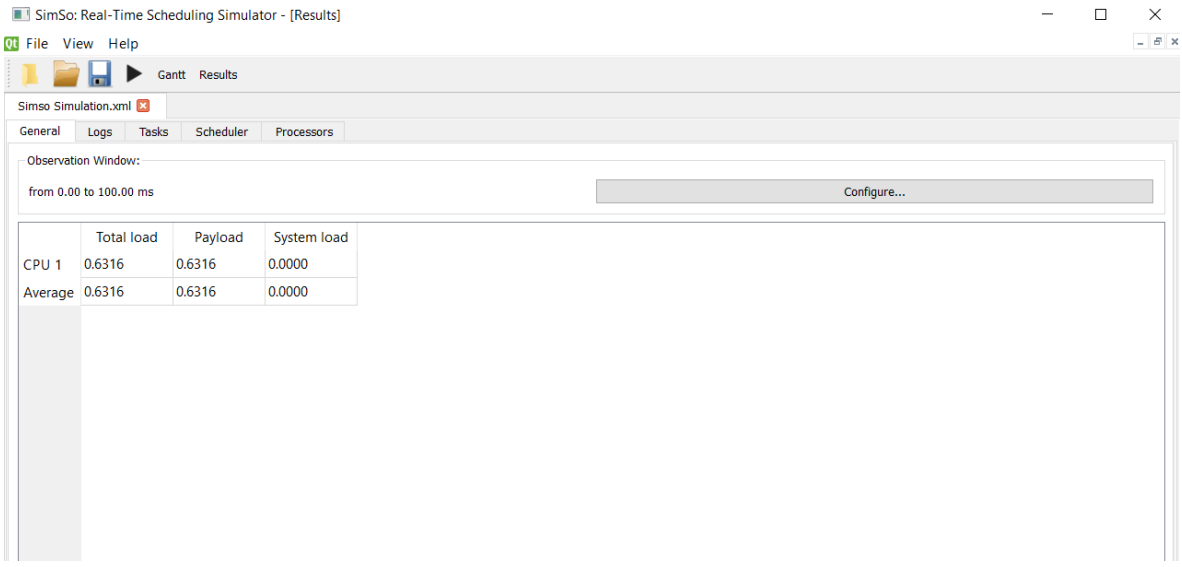
Worst case is 100ms

After sorting the table & doing analysis for the 6 tasks by sorting them ascendingly according to periodicity

Task	Equation & Result	Schedulable?
Load 1	$W1(10) = 5m + 0 = 5m$ $5 < 10$	Yes
UART	$W2(20) = 140u + (20/10)5m = 10.14m$ $10.14 < 20$	Yes
Button 1	$W3(50) = 30u + (50/20)140u + (50/10)5m = 25.31m$ $25.31 < 50$	Yes
Button 2	$W4(50) = 30u + (50/50)30u + (50/20)140u + (50/10)5m = 25.34m$ $25.34 < 50$	Yes
Periodic	$W5(100) = (100/50)30u + (100/50)30u + (100/20)140u + (100/10)5m + 94u = 50.914m$ $50.914 < 100$	Yes
Load 2	$W6(100) = (100/50)30u + (100/50)30u + (100/20)140u + (100/10)5m + 94u + 12.5m = 63.414m$ $63.414 < 100$	Yes

5. Screenshots from Simulators

a. SimSo



SimSo: Real-Time Scheduling Simulator - [Model data]

File View Help

Gantt Results

Simso Simulation.xml

General | Scheduler | Processors | Tasks

id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by	Priority
1	B1	Periodic	No	0.0	50.0		50.0	0.04		1
2	B2	Periodic	No	0.0	50.0	-	50.0	0.04		1
3	Perodic	Periodic	No	0.0	100.0	-	100.0	0.1		1
4	UART	Periodic	No	0.0	20.0	-	20.0	0.18		1
5	Load 1	Periodic	No	0.0	10.0	-	10.0	5		1
6	Load 2	Periodic	No	0.0	100.0	-	100.0	12		1

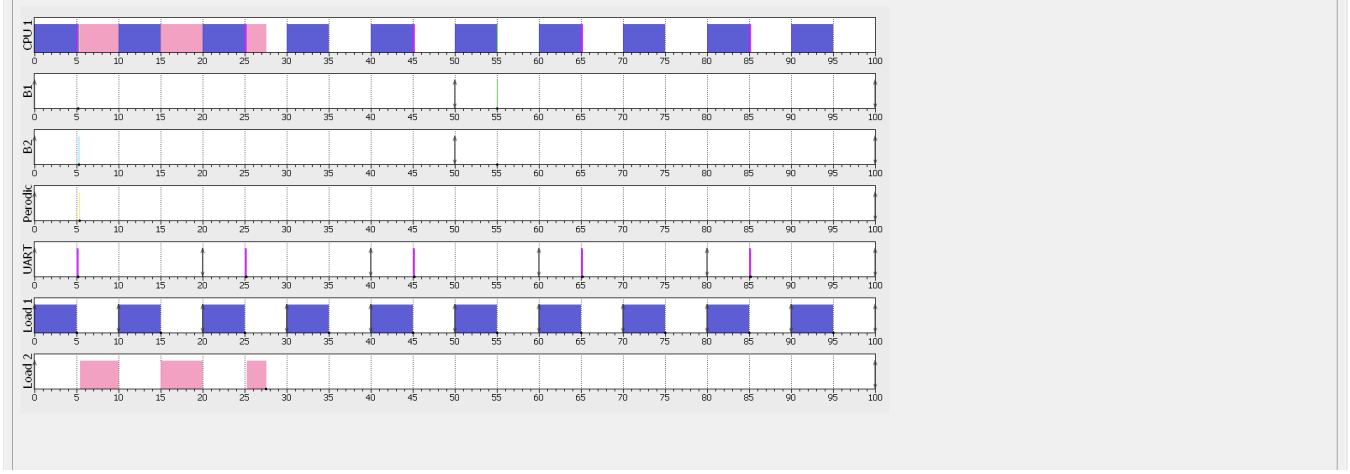
SimSo: Real-Time Scheduling Simulator - [Gantt chart]

File View Help

Gantt Results

* Simso Simulation.xml

Zoom + Zoom - Configure



b. Keil